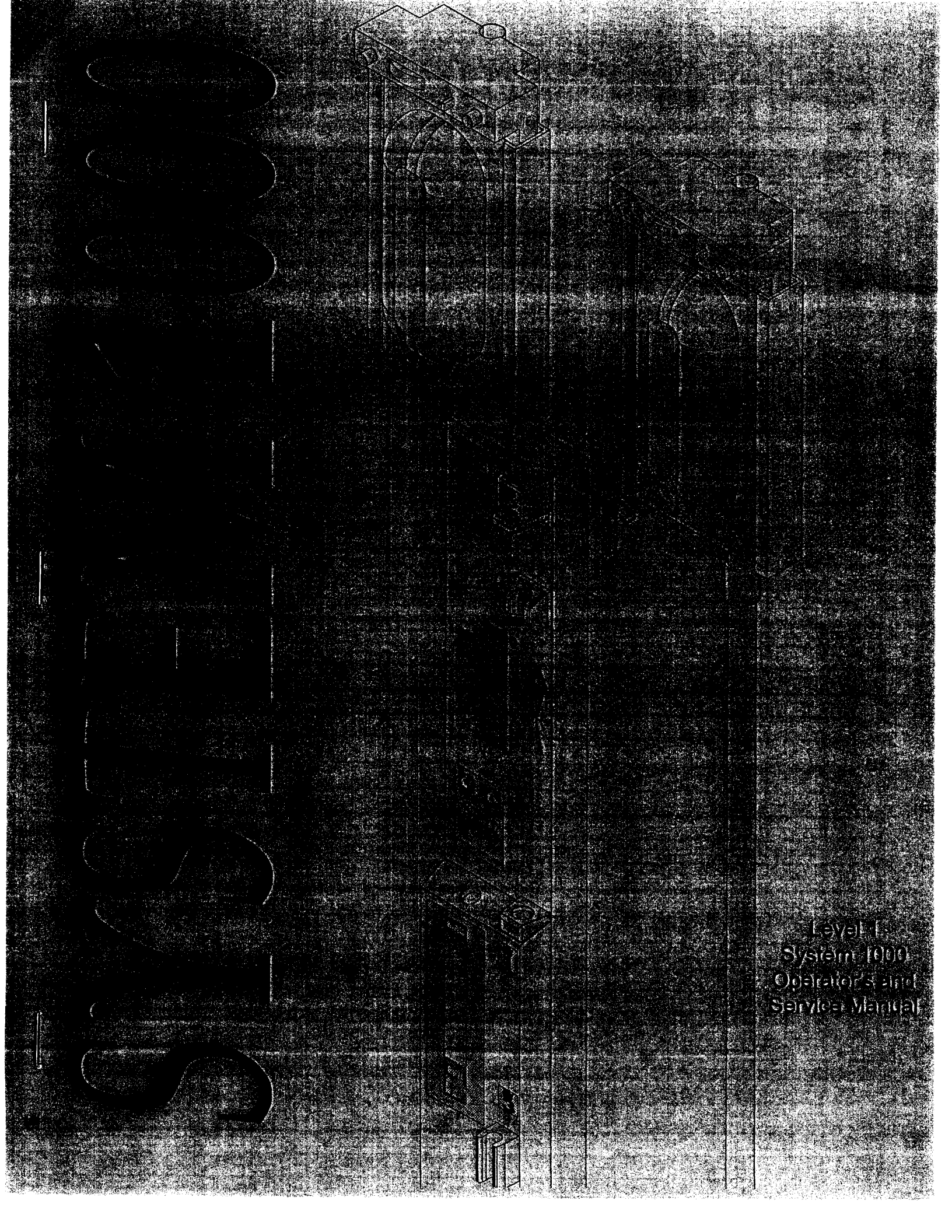

Level 1
System 1000
Operator's and Service Manual

System 1000 Operator's and Service Manual

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prior written permission unless otherwise stated.

*Cover is shown with H-2 Pressure Infusers as an accessory product.

ECO #240

Part # 4533700

October 21, 1996 (Rev E)

About This Manual

This manual contains important information about the safe assembly, use and service of the System 1000. SIMS Level 1, Inc. urges you to read this manual carefully and follow it's recommendations to assure successful use of the System 1000.

WARNING

These messages indicate information or procedures that if not followed correctly can cause improper results, damage to the equipment, injury to personnel, or patient death.

Messages that are headed by "**CAUTION:**" indicate information or procedures that if not followed correctly can cause improper results and damage to the equipment.

Messages that are headed by "**NOTE:**" indicate information or procedures that if not followed correctly can cause improper results.

Purpose

The Level 1 SYSTEM 1000 has been designed for safe and rapid in-line warming of I.V. fluids as they are administered to patients. Disposable sets designed for warming at various infusion rates are available. Blood and packed RBC's from all auto transfusion systems may be infused through the Level 1 I.V. Sets, and will be delivered near 40°C. High flow capacity, warm fluid delivery, simple operation, and continuous on-board safety systems make the Level 1 SYSTEM 1000 the ideal choice for all procedures requiring infusion of normothermic fluids. Typical uses of the system include all routine surgery, blood and fluid warming for I.C.U., ER and Trauma.

Concept

The SYSTEM 1000 employs a disposable heat exchanger. Similar to extra - corporeal warming, warmed water is rapidly circulated through an anodized aluminum tube. The use of a thermal conductor, rapid warm water circulation, and counter-current flow all contribute to the high warming capacity of the SYSTEM 1000.

A complete block diagram of the system best describes it's operation. An onboard pump circulates warm water through the disposable set. You will note that the circulating water bath and the infusate flow against each other which maximizes heat transfer. This diagram describes the essence of all Level 1 fluid warmers.

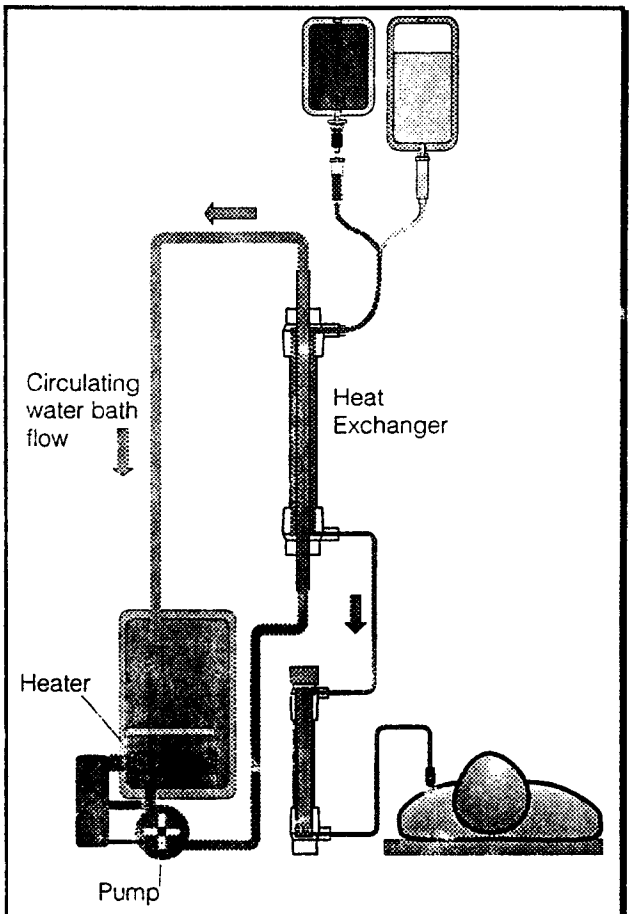


Figure 1. Block Diagram of Level 1 Fluid Warmers.

Safety

Filter with Gas Vent

Level 1 Disposable Sets employ a unique Gas Vent which vents micro-bubbles of gas that are always released from fluids as they are warmed. In many other warming systems, these micro-bubbles are actually delivered to the patient along with the warmed fluids. The Filter with Gas Vent in the I.V. Sets contains a 170-micron screen filter to trap macro-aggregates. This filter is connected with luer-locks and can be easily changed without patient disconnection or repriming of the entire disposable set. The Filter with Gas Vent should be changed every three hours or when the filter becomes clogged, which ever comes first.

Temperature control

The SYSTEM 1000 employs a safe circulating water heating system, inherently free of any "hot spots." The primary temperature control circuit sets the circulating water to a temperature of 42°C. In the unlikely event of a malfunction of this circuit, a second "watchdog" circuit will visually and audibly alarm and stop the circulating water pump. Fluid present in the heat exchanger while the unit is operating is never exposed to any damaging temperatures.

WARNING

In the event of an over temperature alarm, immediately stop the fluid flow to the patient and remove the fluid warmer from service. The unit must not be put back into service until it has been repaired or replaced by SIMS Level 1, Inc.

Electrical safety

A special low leakage heater is used in the Level 1 SYSTEM 1000. This heater is electrically grounded through the power cord providing an extra measure of patient and operator safety. Our system 1000 has also been tested to UL 544 standards by ETL and each unit is labeled to show that it has met with those current standards.

Unpacking and Set up

The system 1000 packaging should contain the following items,

Contents	Quantity
System 1000	1
Manual	1
Y-connector	1
Black tubing	1

1. Attach the system 1000 to an I.V. pole using the two pole clamps located on the rear of the unit.

CAUTION: Do not mount the system 1000 more than 10" above the floor. 10" is indicated by a black mark on the line cord.

2. Unscrew the two thumb screws on the flanking brackets and slide the two chrome poles to the upright position. The chrome poles should be flush with the bottom bracket.

3. Line up the holes in the chrome poles before re-tightening the two thumb screws.

CAUTION:

This unit must be assembled and tested by Level 1 technical personnel or an authorized distributor of Level 1 prior to placing the device into service.

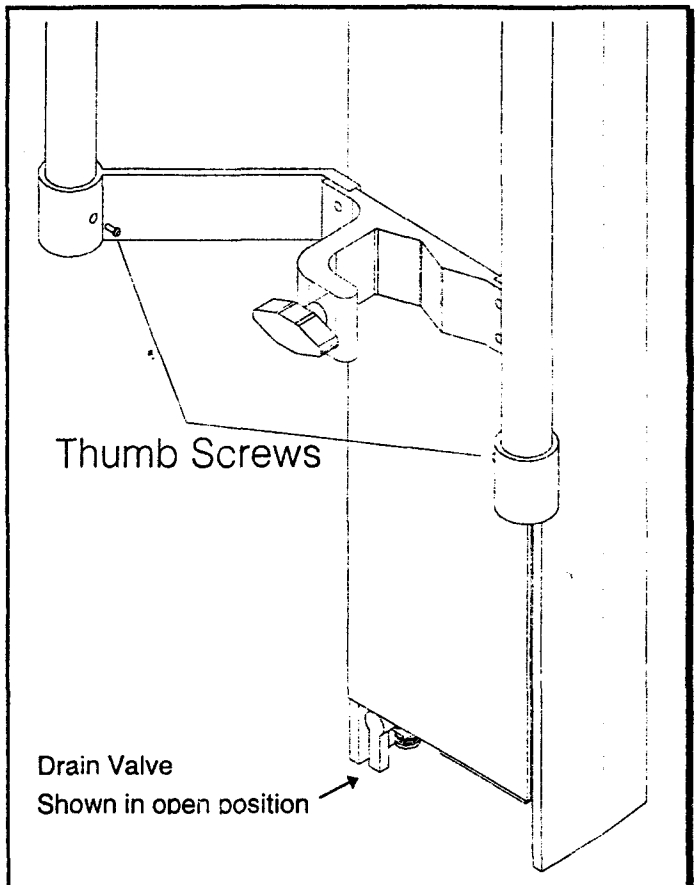


Figure 2. Setting up chrome poles. Rear view of System 1000

4. Remove the fillport plug and fill the tank with distilled water, make sure that the drain valve is closed. Replace the fillport plug.

WARNING

Tap water will increase electrical leakage current. For proper system operation and component life, use only DISTILLED WATER in the water reservoir. Failure to do so may result in patient injury or death.

5. Plug the unit into the appropriate electrical outlet. (See specifications for details)

Accessories: Pressure Infusion System

Every SYSTEM 1000 is equipped with an onboard compressor that is used to operate Level 1 pressure infusers (H-2's). Pressure Infusers are sold as an accessory to the SYSTEM 1000 and allow you to infuse fluids under pressure. If you would like more information on this product call the Level 1 customer service department. Pressure Infusers are not required to operate the SYSTEM 1000, they are just an added feature that is available if you need it. If you have purchased a pair of Pressure Infusers refer to the following set-up instructions for proper installation.

The Pressure Infuser packaging should contain the following items,

Contents	Quantity
H-2 Pressure Infuser	2
Y-connector	1
Black tubing	1

Set-up

Be sure that the chrome poles on the SYSTEM 1000 are in the upright position.

1. Loosen the two thumb screws on the back of the H-2 and slide the H-2 over the top of the chrome pole.

2. Secure the H-2 in place by tightening the two thumb screws. Repeat steps 1-2 for the other H-2.

3. Remove the orange plug from the connector which is located on the back of the SYSTEM 1000. This is done by pressing the red plastic ring and pulling the plug out.

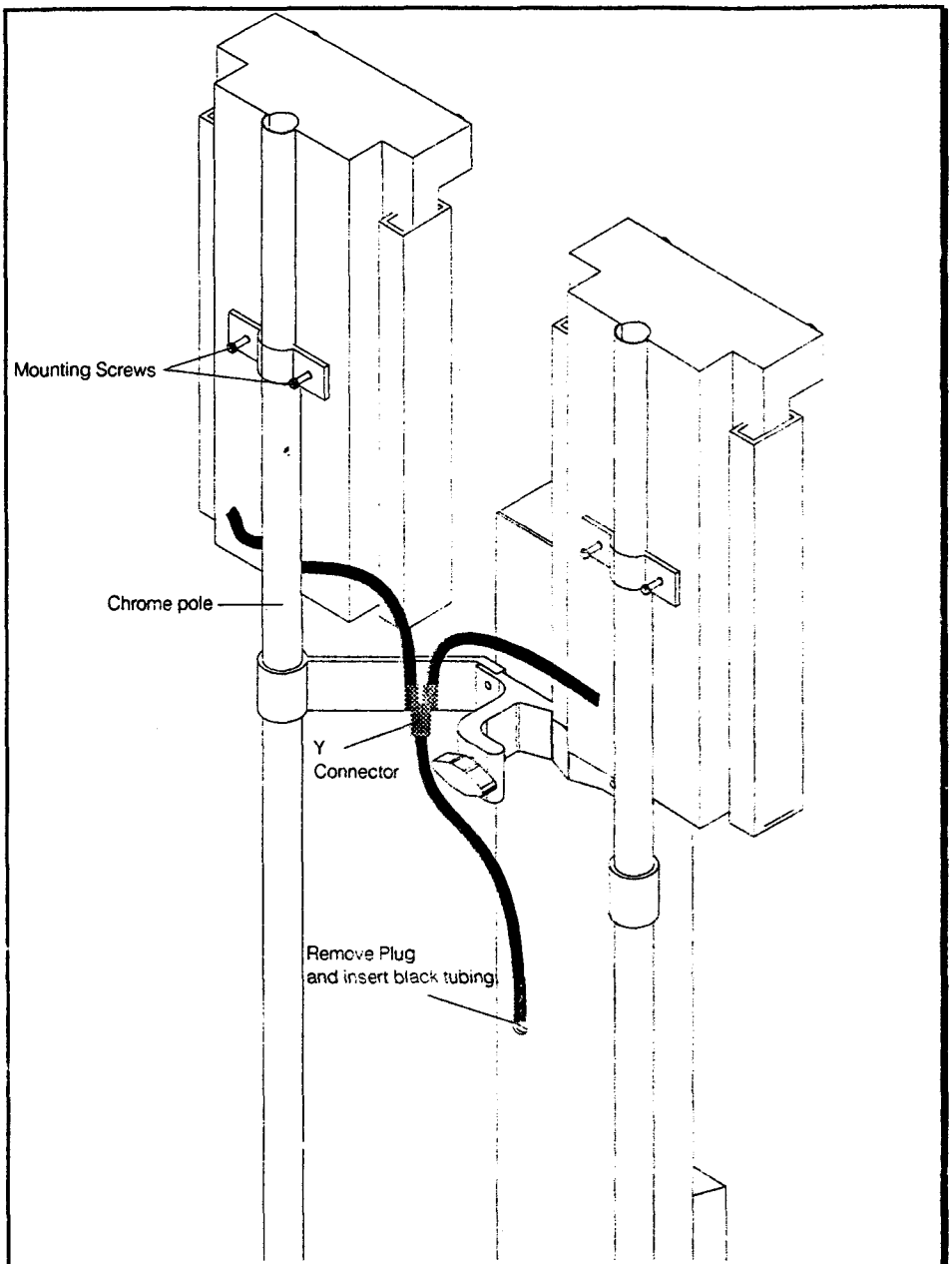


Figure 3. Installing Pressure infusers.

4. Press the piece of black tubing firmly into the connector on the back of the H1000 until it bottoms out.

5. Press the black tube from one of the H2's into the Y connector. Press the black tube from the other H-2 into the Y connector. Once the System 1000 is turned on, pressure can be applied with a flip of the toggle switch to the (+) position. Make sure the door is closed and latched. The toggle switch is located on the front of the H-2.

Disposables: Set up and Performance

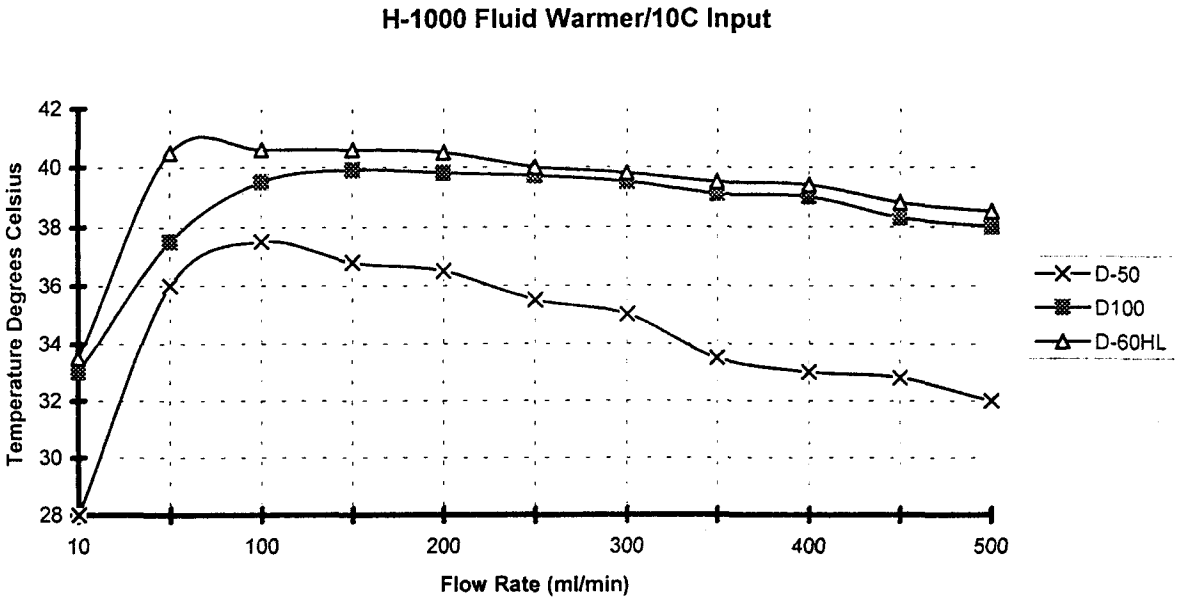


Figure 4. Disposables Performance

The disposable sets have been designed to be highly effective and easy to use in combination with the SYSTEM 1000. By following the 1-2-3 instructions found on the SYSTEM 1000 Fluid Warmer, properly trained users can confidently have the system safely set-up and operating within seconds.

WARNING:

Bending the heat exchanger may damage the inner metal tube. Do not bend the heat exchanger tube. If tube is bent the result may be patient injury or death.

Follow the numbers found on the SYSTEM 1000.

1. Push the bottom end of the heat exchanger into the bottom heat exchanger Socket, #1. Be sure the heat exchanger is fully seated.

2. Slide the #2 top socket up. Snap the heat exchanger into the heat exchanger guide. Be sure it is fully seated. Slide the top heat exchanger socket down over the heat exchanger tube.

If the top socket is not pressed down correctly, a red indicator next to the top socket will illuminate. When the top socket is properly seated the red indicator will go out.

3. Insert the Filter with Gas Vent into the holder #3 on the front of the cabinet.

When the disposable set is correctly installed, a GREEN "SYSTEM OPERATIONAL" light will illuminate on the display panel when the SYSTEM 1000 is plugged in and turned on. If the disposable set is incorrectly installed and the unit is turned ON, the red "CHECK DISPOSABLES" light will illuminate and an intermittent alarm will sound.

Press the green power switch on the front of the cabinet and allow the unit to reach operating temperature while the disposable set is being primed. It takes between 3 and 7 minutes for the water in the SYSTEM 1000 to reach operating temperature.

Priming Disposable Sets

WARNING:

I.V. sets require that aseptic techniques be followed. Follow "hospital policy and procedures." Failure to do so may resuit in patient injury or death.
Remove all air before spiking bags with the disposable set.

1. CLOSE the Y-Set and roller clamps on the disposable set.

2. ASEPTICALLY remove one bag spike cap and spike it into a fluid bag port with a twisting motion. Do not touch the spike or bag port opening. Hang the fluid bag on the adjustable I.V. Pole.

3. Prime the disposable set following the priming instructions supplied with each set.

4. After the patient line is primed, remove the Filter with Gas Vent assembly from its holder and tap it against the cabinet several times until all trapped air bubbles have been vented out.

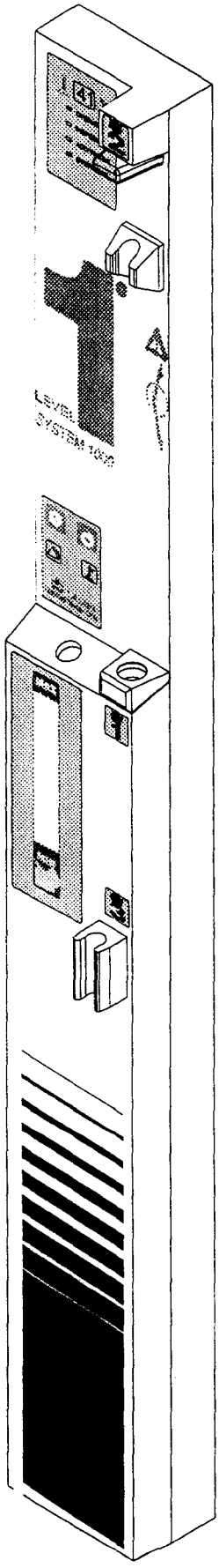


Figure 5. Front View of the System 1000

WARNING

All air must be removed from the fluid lines prior to connection to the patient. Failure to do so could result in the introduction of air to the patient. Monitor the fluid lines to ensure they are air-free. Never administer fluids if there are air bubbles in the line between the filter chamber and the patient connector. Failure to do so may result in patient injury or death.

Re-Priming Disposable Sets

If air is inadvertently introduced into the disposable set, it may be removed as follows:

1. CLOSE the roller clamp on the patient line.

2. SPIKE a new fluid bag and allow the Filter with Gas Vent to prime itself.

3. After checking to be sure there is no air in the patient line, partially OPEN the Roller Clamp and observe air bubbles leaving the heat exchanger.
IMPORTANT
Adjust the Roller Clamp so the air pocket in the top of the Filter with Gas Vent does not exceed 1/4 inch. When air bubbles have stopped leaving the heat exchanger and all air is vented from the filter with gas vent, resume normal flow.

Replacing Filters in I.V. Disposable Sets

Replacement of Filter with Gas Vent.
1. CLOSE all clamps on the disposable set and new filter with Gas Vent.
2. REMOVE used filter assembly from the holder while still connected to the disposable set.

3. INSTALL new filter assembly into holder.

4. DISCONNECT upper luer-lock fitting, REMOVE bio-barrier cap and CONNECT new filter inlet.

5. Holding used filter horizontally, DISCONNECT patient line luer-lock. CONNECT used Filter with Gas Vent luer-lock fittings together and discard.

6. With filter outlet tube clamped, OPEN clamp above heat exchanger. The Filter with Gas Vent will prime itself.
7. SLOWLY release the outlet tube clamp and allow outlet tube to fill completely, exhausting all air from line.

8. REMOVE second bio-barrier cap and connect outlet tube luer-lock to patient line.

9. REMOVE the filter from its holder and TAP against the cabinet several times until all trapped air bubbles have been vented out. Return the filter to it's holder.

WARNING

Thoroughly check Patient Line for air bubbles before opening Roller Clamp. If air bubbles are present, disconnect from patient and re-prime before continuing infusion. Failure to do so may result in patient injury or death.

System 1000 Hardware

An onboard water supply is precisely heated to 42°C and rapidly circulated through the heat exchanger of the disposable set. Two independent circuits continuously control and monitor water temperature, and will shut the system down and alarm in the event of an over-temperature condition.

Interlocks

Three low voltage interlocks are located in the cabinet. They sense the presence of properly installed heat exchanger and gas vent. These interlocks prevent the pump from pumping water when there is no disposable in place to complete the circulation loop. The DISPLAY PANEL provides information for safe, convenient use of the device.

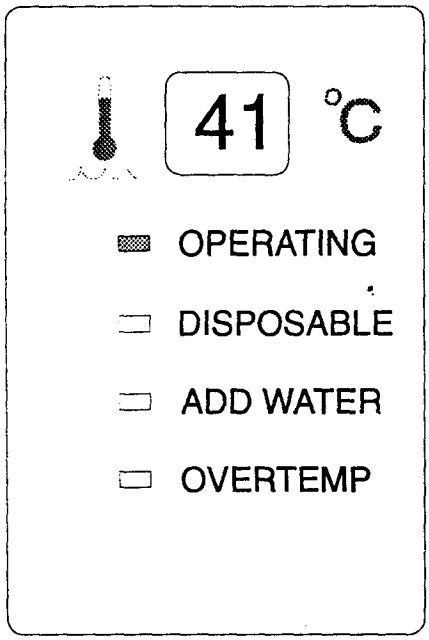


Figure 6. H1000 Display Label.

1. WATER TEMPERATURE
Displays temperature of the circulating water in °C. This is **not** the temperature of the fluid delivered to the patient.

2. SYSTEM OPERATIONAL
This GREEN indicator illuminates when the power switch is ON and the heat exchanger has been properly installed.

3. ADD WATER
This RED indicator and pulsing AUDIBLE ALARM indicate additional distilled water must be added to the water reservoir.

4. CHECK DISPOSABLES
This RED indicator and pulsing AUDIBLE ALARM indicate the heat exchanger is NOT properly installed. There is also a RED indicator next to the top socket that illuminates if the #2 socket is not seated properly.

5. OVER TEMPERATURE
This RED indicator and AUDIBLE ALARM indicates an over temperature condition.

Leakage Current Testing

NOTE: This device is equipped with disposable sensing interlocks. A Level 1 Heat Exchanger is required to operate the device and perform leakage current testing. Non-Sterile Test Sets are available from Level 1 for this purpose.

WARNING

Do not defeat the disposable sensing interlocks or try to operate the unit without a disposable heat exchanger in place. The 1000 may spill water if interlocks are defeated.

Leakage Current Tests should be performed with the heater circuit in the full ON condition. In order to be sure the heater circuit is in a full ON condition, Leakage Current Tests should be performed on units which have been allowed to stand

close to room temperature. The System 1000 warms up quickly, test readings should be taken within 1 minute of startup.
Units exceeding 100 micro amps electrical leakage should be removed from service and returned to Level 1 for repair.

Alarm Testing

Alarm testing requires a Level 1 Heat Exchanger and gas vent to be in place on the System 1000. Non-sterile test sets are available from Level 1 for this purpose.

Add Water Alarm

The System 1000 is equipped with a float switch which senses the water level in the on-board reservoir. When the water level is too low, a RED indicator on the display panel illuminates and an audible alarm sounds. In the alarm condition the circulating pump will not be running. With a test heat exchanger in place, the ADD WATER ALARM may be tested by turning the drain valve on the bottom of the unit 90 degrees clock wise and allowing some of the water to drain out into a container.

Check Disposables Alarm

Three interlocks sense a properly installed heat exchanger. If a heat exchanger is not in place and the power switch is ON, a RED indicator will illuminate and an audible alarm will sound. With the unit running, the interlocks may be tested one at a time by following these simple steps.

1. Top Heat Exchanger Socket
Slide up slowly, two red indicators will illuminate and the audible alarm will sound.

2. Heat exchanger interlock
Gently pull on the middle of the heat exchanger, one red indicator will illuminate and the audible alarm will sound. MAKE SURE THAT YOU USE A NON-STERILE DISPOSABLE SET

3. Filter holder interlock
Remove the Filter with Gas Vent, one red indicator will illuminate and the audible alarm will sound.

Over Temperature Alarm

Press and hold the overtemp button on the front of the unit. The over-temperature indicator and the audible alarm will pulse.

NOTE: *Pressing the over temperature or the alarm test switch will disable the System 1000 even after the switches have been released. The unit must be shut off and then re-started to clear the alarm condition.*

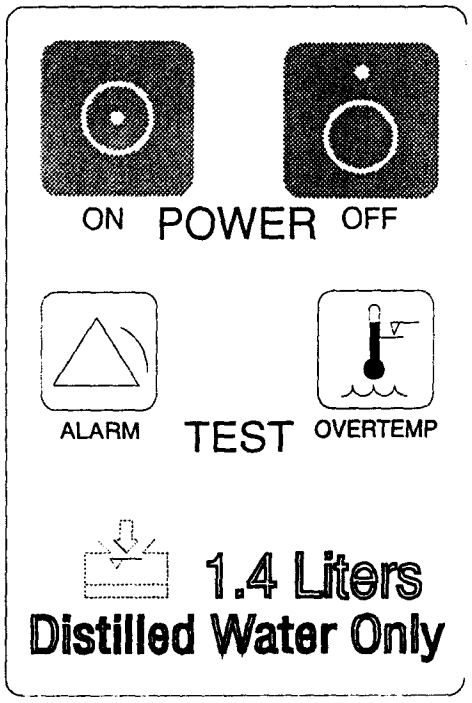


Figure 7. On/Off and alarm test buttons

Alarm Test Switch

The audible alarm and all RED L.E.D.s may be tested by pressing the alarm test button on the front of the cabinet.

Performance Testing

Performance testing requires a Level 1 D-series Disposable set to be in place on the System 1000. Non-sterile Disposable Test Sets are available from Level 1 for this purpose.

A simple test allows periodic checking of the overall operating efficiency of the System 1000.

1. COLD START TEST

Store the System 1000 unit in a room where the room temperature is approximately 21°C (70°F). With a Disposable Set in place, note the time and turn the power switch ON. The green system operational indicator will illuminate. Rapidly rising numbers will appear on the water temperature display. 41°C will appear in approximately 3 to 7 minutes on an efficiently operating unit.

NOTE: If the system 1000 does not pass the cold start test, it should be returned to SIMS Level 1, Inc. for service.

Specifications

Equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or oxygen or with nitrous oxide.

Physical Specifications

Length, overall	48 inches	(1.22m)
Width, overall	13 inches	(34cm)
Depth, overall	10 inches	(26cm)
Weight, assembled, dry	20 pounds	(9.5kG)
Distilled water capacity	0.43Gal	(1.4L)
Air source pressure	300 mmHg	

Electrical Specifications

Input Voltage Range	95 to 140 VAC
Operating Frequency	50-60 HZ
Operating Current	12 Amps
Auxiliary outlet	1.5 Amps
Power Cord, Hospital grade	

Maintenance

CLEAN EXTERIOR - EVERY USE

Clean the entire SYSTEM 1000 with a spray of warm soapy water solution or a commercial non-abrasive cleaner and a soft cloth after every use. Cold sterilizing solutions may be used, but strong chemical concentrations may discolor some of the plastics on the device. Do not use cleaning agents containing abrasives.

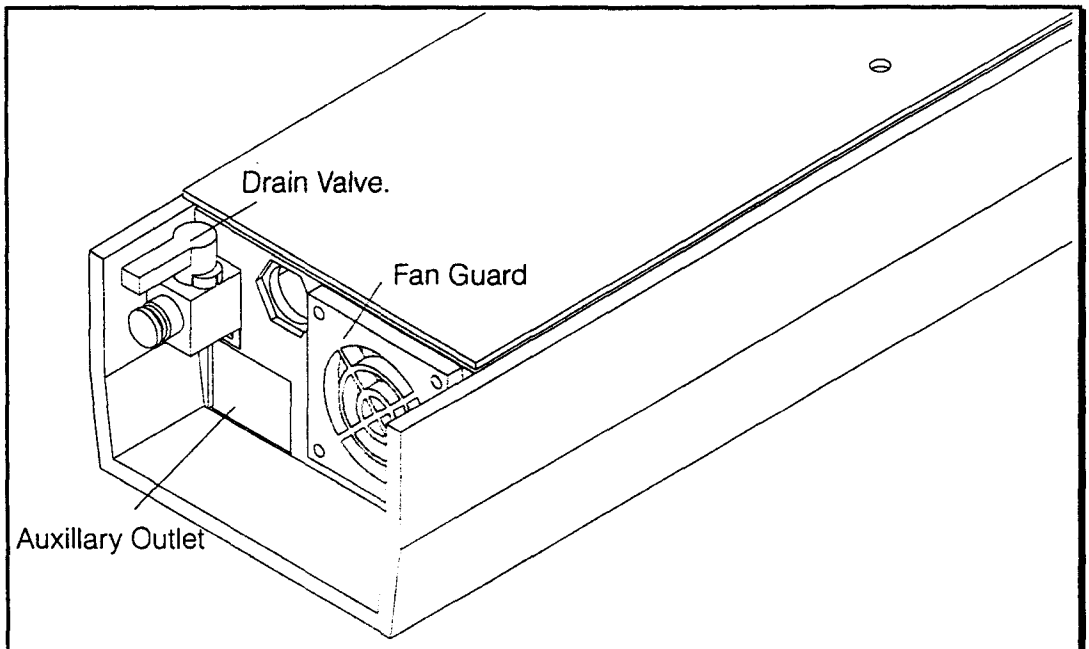


Figure 8. Bottom view of H1000. Shows location of Drain valve, Fan guard, and auxiliary outlet.

CHANGE DISTILLED WATER - EVERY 30 DAYS

Drain the water by turning the drain valve clockwise 90 degrees until the tank is empty. Close the drain valve and refill with distilled water.

CHANGING O-RINGS EVERY 12 MONTHS

Remove the o-ring by pulling it out of the bottom/top socket with a pair of needle nose pliers or prying it out with a small screw driver. The new o-rings are then lubricated and pressed in.

GREASE O-RING SEALS - EVERY 30 DAYS

Place a small amount of silicone grease on a cotton swab or the end of a finger and apply all around the O-Rings in the bottom and top heat exchanger sockets. It is not necessary to disassemble the sockets to grease them.

CLEAN FAN FILTER - EVERY 30 DAYS
Remove the fan guard from the bottom of the unit and clean with warm soapy water. The fan guard snaps in and out.

GENERAL INSPECTION -- EVERY USE
Visually check the condition of the device. Remove any unit from service which shows physical damage or one in which the test disposable set does not install easily.

WATER BATH DISINFECTION
To disinfect the circulating water bath, the following procedure may be employed:
Unplug the unit before servicing.
Remove the fillport cap.
Empty all water from the reservoir tank.
Fill the reservoir tank to the full mark with either:

10% Hydrogen Peroxide / distilled water solution which consists of approximately 1,200 ml's of distilled water and 200 ml's of Hydrogen Peroxide (3% Hydrogen Peroxide by volume)
or
An Isopropyl alcohol / distilled water solution not exceeding 35% Isopropyl alcohol by volume.(EX. mix equal portions of 70% Isopropyl alcohol solution and distilled water to achieve a 35% solution).

Insert a designated disposable into the machine.
Turn the unit on and let the solution circulate for 10 minutes.
Switch the unit off and empty.
Thoroughly rinse the unit with distilled water or equivalent.
Refill the reservoir tank with one of the above solutions, 10% Hydrogen Peroxide or 35% Isopropyl alcohol with distilled water. Refer to set-up instructions for filling options.
These suggested instructions are designed to be used in conjunction with established hospital procedures.

Service

ALL SERVICE MUST BE PERFORMED BY SIMS LEVEL 1, INC. OR ITS AUTHORIZED AGENTS. SERVICE BY OTHERS VOIDS THE WARRANTY AND TRANSFERS LIABILITY FOR MALFUNCTIONS OF THE DEVICE TO THE SERVICING ORGANIZATION.

Warranty Service

Units received for repair which have not been obviously abused or impact damaged and still under warranty will be promptly repaired and returned at no charge. Contact the Level 1 Service Department before shipping the unit to Level 1 for repair. The Service Department will issue you a Return Goods Authorization Number (RGA #). The Service Department will want to know the SERIAL NUMBER of your unit and a description of the problem.

This Level 1 Fluid Warmer is warranted by SIMS Level 1, Inc. to be free of material and workmanship defects for a period of 1 year (12 months) from the date of purchase, abuse and impact damage excluded. Level 1 reserves the right to replace any or all components in lieu of repair. During the period this warranty is in effect, any Level 1 H-1000 Fluid Warmer found to be defective and shipped to Level 1, shipping costs prepaid, will be repaired or replaced. This warranty does not cover misuse, impact damage or obvious abuse of the device. No warranty or affirmation of fact, expressed or implied, other than stated above, is made or authorized by Level 1, and Level 1's liability in all events is limited to the purchase price paid for the device.

NOTE: Federal Law requires contaminated Medical Equipment to be cleaned and disinfected before shipment. If this is not done your unit will be immediately returned as received. Be sure that ALL water is drained from the unit before packing it for shipment

FOR QUESTIONS, CONTACT THE LEVEL 1 SERVICE DEPARTMENT (800) 553-8351 or your local distributor. Be sure that all of the following information is included: hospital name, address, telephone number, person to contact, and the apparent problem along with the serial number of the device.

For service ship prepaid to:
SERVICE DEPARTMENT
SIMS LEVEL 1, INC.
160 WEYMOUTH STREET
ROCKLAND, MA 02370-1136

Non-Warranty Service

Units received which have suffered obvious abuse or impact damage and units no longer under Warranty will be promptly inspected and a written estimate of

repair costs will be sent or faxed to you. A purchase order will be required from the hospital consistent with the written estimate.

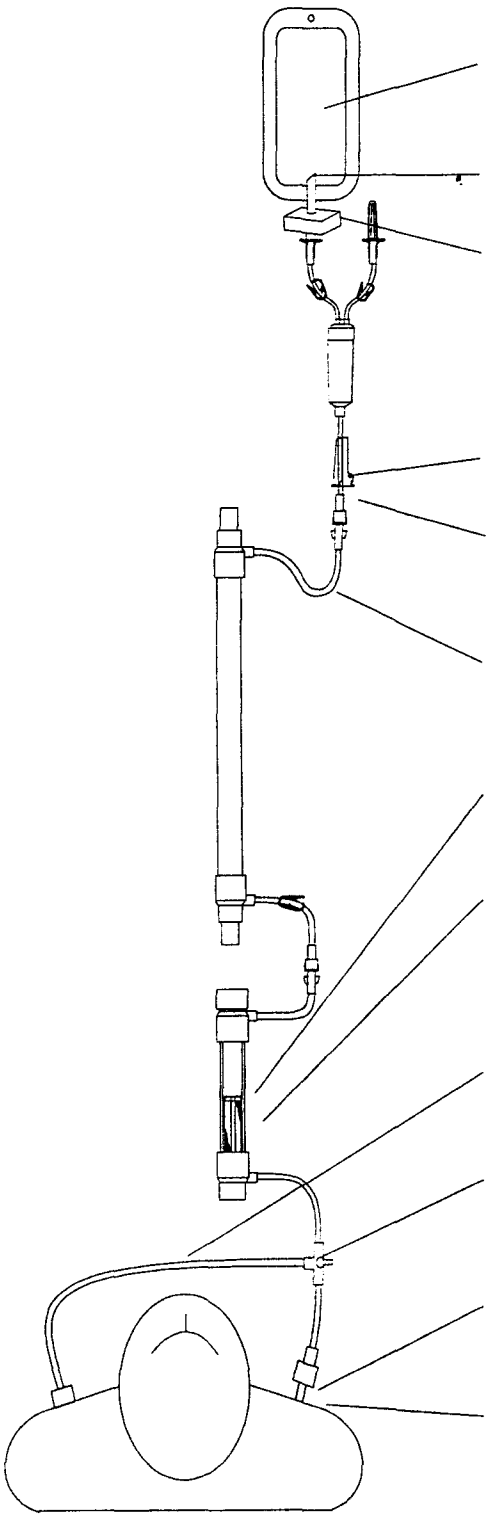
SERIAL NUMBER LABEL

Units returned for warranty service must have serial numbers intact. Those with missing or altered serial numbers will be serviced as non-warranty repairs.

PROMPT DISPOSITION

Level 1 will make every effort for prompt correction or other adjustment with respect to any product which proves to be defective.

Trouble Shooting



Many factors which are insignificant in low fluid administration are restrictors of higher flow infusion. If you encounter flow restriction with any Level 1 Fluid warmer, CHECK EACH OF THESE POSSIBLE CAUSES.

OLD BLOOD
Stored blood begins to develop particulate within 5 to 7 days. This may partially block fluid pathways, impeding flow.

FULLY SPIKED BAG
Bag port membranes may only be split, not compleatly pierced.

BAG PORT FILTER(if used)
40 micron to 80 micron filters used between the blood bag and the bag spike of the Disposable set may restrict flow because:

1. Cold, viscous blood does not flow well through small pore filters.
2. As they are directly connected to the source of particulate with no pre-filtering, they clog quickly.
3. They may trap air which can block filter media surface area.

CLAMPS PARTLY ENGAGED
Check to be sure all clamps are FULLY open.

TUBE SET
Leaving clamps engaged for extended periods of time when the Disposable Set is not in use (such as pre-set-up) will cause the tubing to take a SET in the clamped position.

TUBE KINK
Be sure no tube kinks are present anywhere in the set, especially in the Y-set when a pressure cuff is employed and the I.V. Pole is used in a lowered position.

TRAPPED AIR IN FILTER
As noted in the Priming Instructions, remove the Filter from the holder and tap against the Cabinet to dislodge air bubbles and allow them to vent out.

CLOGGED FILTER
If good quality blood is used, this filter should never cause flow restriction. In the event of a clogged filter, this component may be changed. See REPLACING FILTERS section of this manual. If frequent clogging is encountered, discuss the QUALITY of the blood being used with you Blood Bank.

EXTENSION LINES
Use only extension lines with a bore of .130" (3.3 mm) or larger, equipped with large bore fittings, such as Level 1 Part No's. X-36 or Y-30.

STOPCOCK or Y ADAPTER
Any fittings attached to the male luer-lock at the end of the Patient Line should have large bores. If their bores are smaller than the male luer-lock bore, they are restrictors.

NEEDLE or CATHETER
If possible, use a minimum 18 Gauge needle or 16 French catheter. Smaller sizes will reduce flow.

Figure 9. Trouble shooting disposable sets.

PROBLEM	THINGS TO CHECK
No Power	Make sure that the unit is plugged in and the power switch is ON. Is it plugged into correct circuit?
"Disposables" alarm	Make sure the heat exchanger, top socket and filter are properly installed. If the top socket is not properly seated, the red LED next to it will light up.
Add water alarm	Most likely your water tank is filled to the minimum level. Top it off with DISTILLED water.
Hot cabinet	Make sure that the air inlet on the bottom of the unit is not blocked or clogged with dust.
Hard to install heat exchanger	Grease o-rings in heat exchanger sockets with silicone grease. Order Part # 80-04-002
Over temperature alarm	Turn off the power switch to clear the alarm. If the unit continues to alarm, remove it from service and call the Level 1 service department.

Maintenance and Calibration Log

Every 30 days you should:

Change Distilled water									
Grease O-rings									
Test alarm switch									

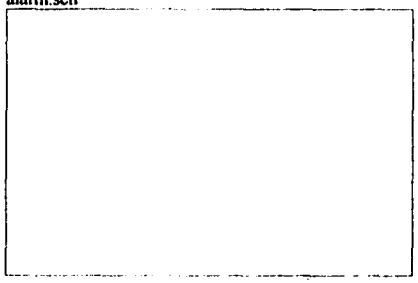
Every 12 months you should:

Replace O-rings									
Clean air filter									
Test Over-temp switch									
Test Float switch									
Test disposable interlocks									
Verify temp. calibration									

Electrical Schematics

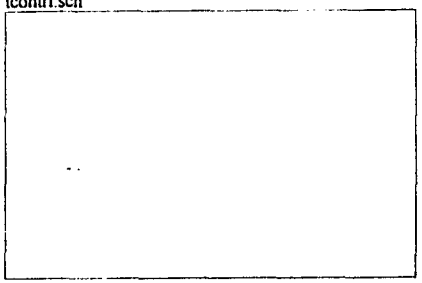
This page is for notes:

Alarm Monitoring
alarm.sch

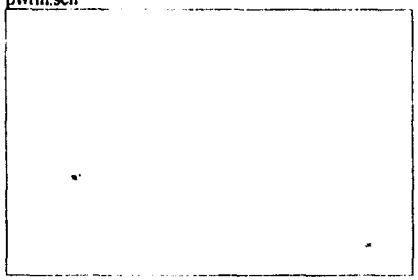


Displays and Audio
display.sch

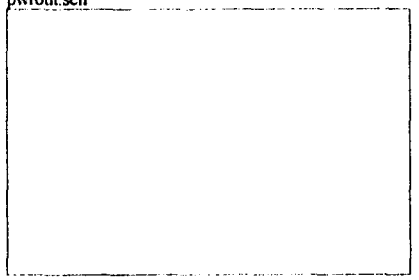
Temperature Control
tcontrl.sch



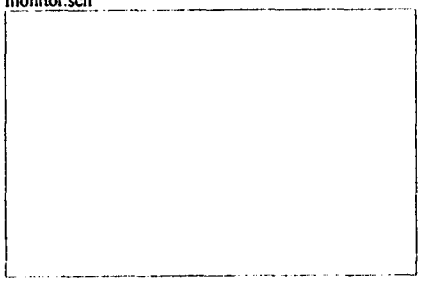
Power Input and AC/DC
pwrin.sch



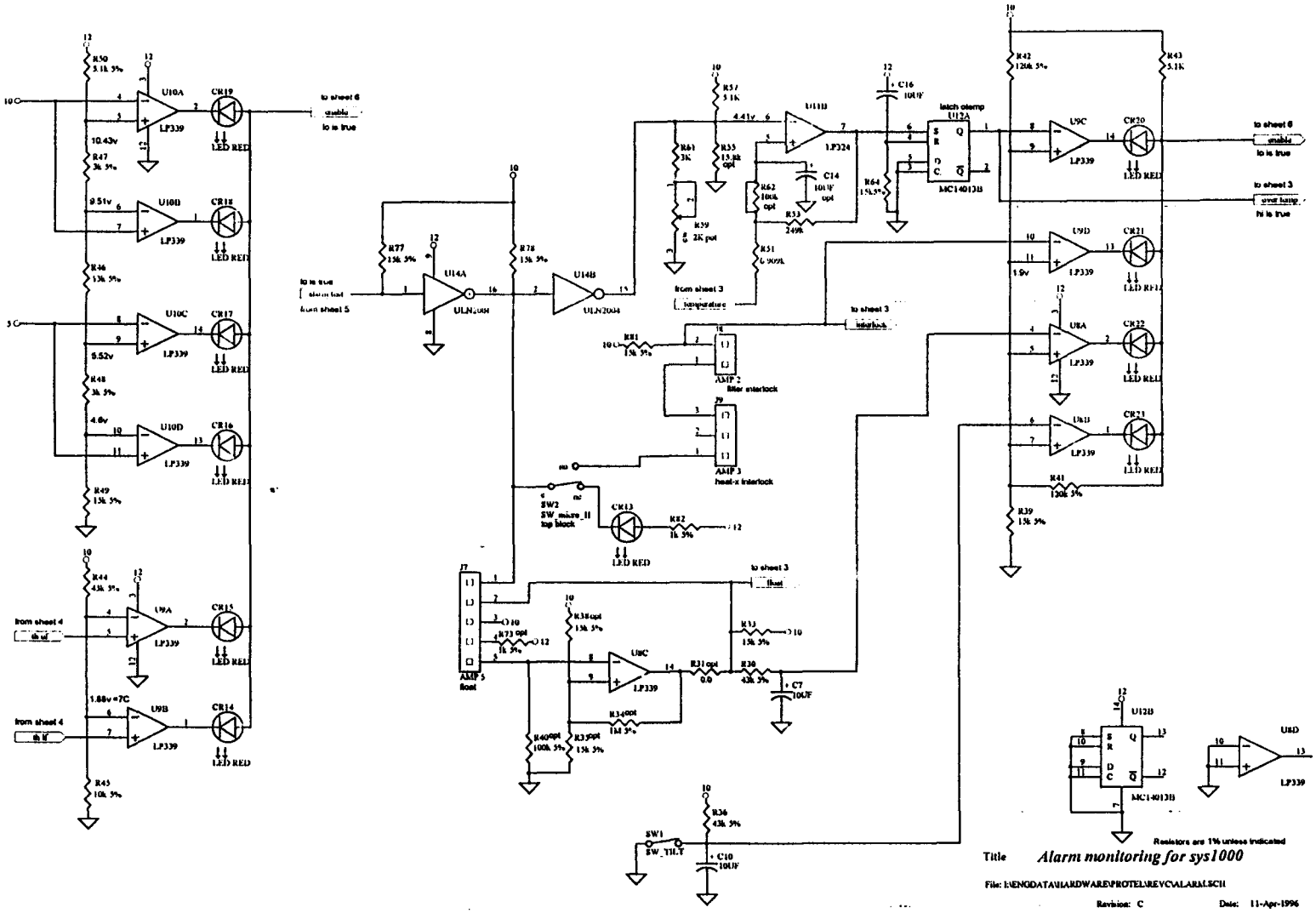
Power Output
pwrout.sch

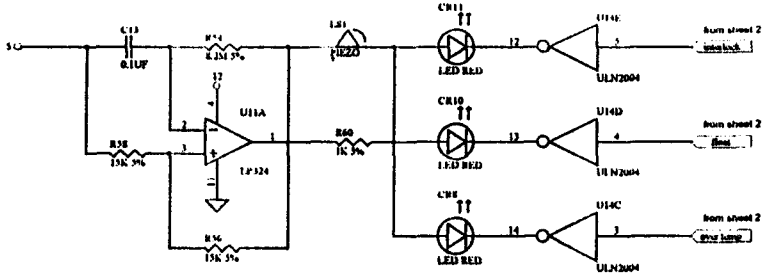


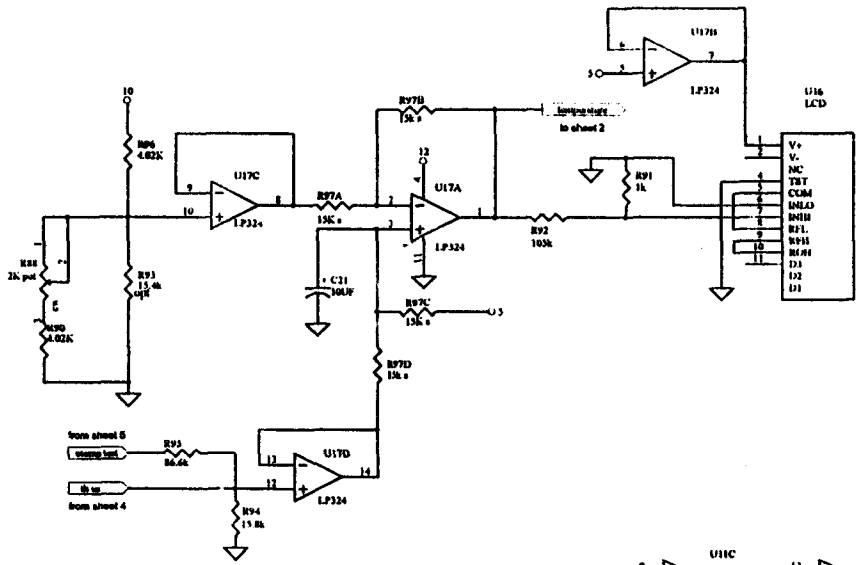
Pump Condition Monitoring
monitor.sch

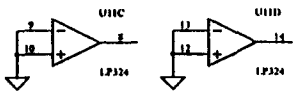


System 1000 Fluid Warmer, Printed Circuit Board
Rev: C Sheet 1 of 7 Size: B Date:11-Apr-1996 160 Weymouth Street
File: I:\ENGDATA\HARDWARE\PROTEL\REVC\603070[illegible], MA 02370


R50 5.1k 5%
U10A
LP339
CR19
LED RED
to sheet 6
enable
lo is true
10.43v
R47 3k 5%
9.51v
U10B
CR18
R46 13k 5%
U10C
CR17
9.52v
R48 3k 5%
4.6v
U10D
CR16
R49 15k 5%
R44 43k 5%
U9A
CR15
from sheet 4
1.88v=7C
U9B
CR14
R45 10k 5%
R57 5.1k
4.41v
U11B
LP324
C16 10UF
latch otemp
U12A
MC14013B
R42 120k 5%
R43 5.1k
U9C
CR20
to sheet 6
enable
lo is true
to sheet 3
over temp
hi is true
R61 3k
R35 15.8k opt
R62 100k opt
C14 10UF opt
R39 2K pot
R33 249k
R64 15k 5%
R51 6.909k
U9D
CR21
1.9v
LED RED
U8A
CR22
U8B
CR23
R41 130k 5%
R39 15k 5%
R77 15k 5%
U14A
ULN2004
R78 15k 5%
U14B
to is true
from sheet 5
from sheet 3
temperature
to sheet 3
interlock
RH1 15k 5%
AMP 2
filter interlock
J9
AMP 3
heat-x interlock
SW2
SW_micro_II
top block
CR13
R52 1k 5%
J7
AMP 5
float
to sheet 3
float
R38opt 15k 5%
R73 opt 1k 5%
U8C
LP339
R31opt 0.0
R30 43k 5%
C7 10UF
R33 15k 5%
R34opt 1M 5%
R40opt 100k 5%
R35opt 15k 5%
R36 43k 5%
SW1
SW_TILT
C10 10UF
U12B
MC14013B
U8D
LP339
Resistors are 1% unless indicated
Title
Alarm monitoring for sys1000
File: I:\ENGDATA\HARDWARE\PROTEL\REVC\ALARM.SCH
Revision: C
Date: 11-Apr-1996
Sheet 2 of 7
Error : 14300CLR.WMF File Not Found
160 Weymouth Street
Rockland MA 02370 USA
PHONE (617) 878-8011
FAX (617) 878-7880







Resistors are 1% unless indicated

Title *Displays and Audio for sys1000*

File: I:\ENGDATA\HARDWARE\PROTEL\REVC\DISPLAY.SCH

Revision: C Date: 11-Apr-1996 Sheet 3 of 7

Error : LOGOC1.B.WMF File Not Found

160 Weymouth Street
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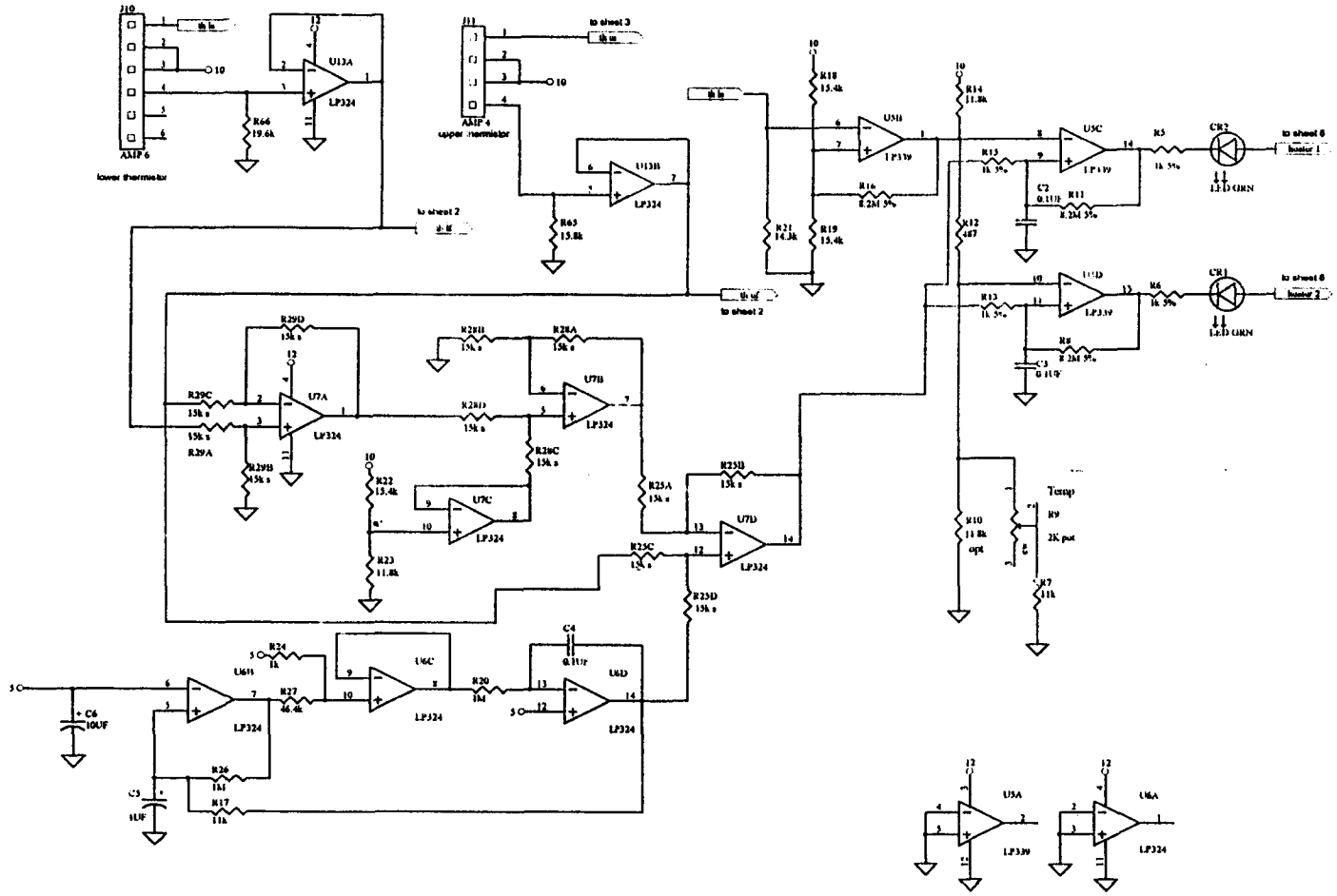
FAX (617) 878-7680



Resistors are 1% unless indicated

Error : LOGOCLR.WMF File Not Found

Title *Temperature Control for sys1000*

File: I:\ENGDATA\HARDWARE\PROTEL\REVC\TCONTRL.SCH

Revision: C Date: 11-Apr-1996 Sheet 4 of 7

160 Weymouth Street
Rockland MA 02370 USA
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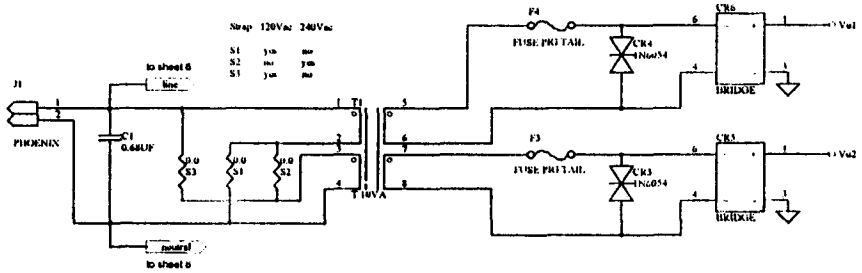

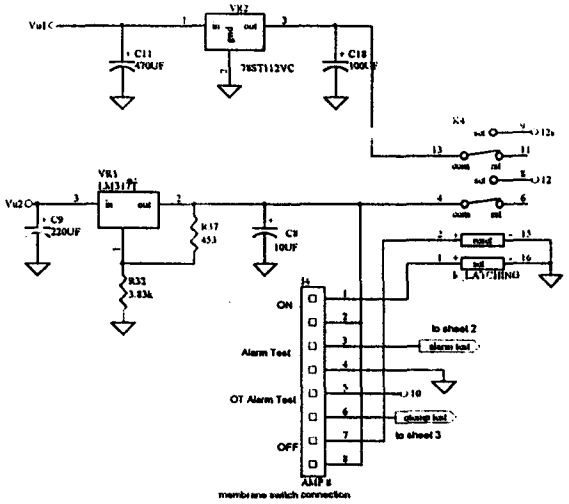

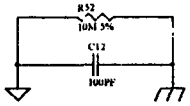

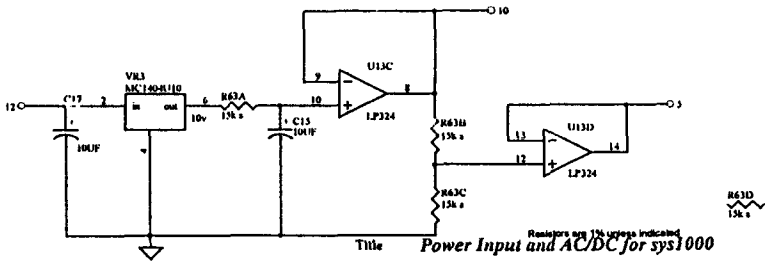

Resistors are 1% unless indicated

Title *Power Input and AC/DC for sys1000*

File: E:\ENGDATA\HARDWARE\PROTEL\REVC\PWRIN.SCH

Revision: C Date: 11-Apr-1996 Sheet 5 of 7

Error : LOGICLR.WMF File Not Found

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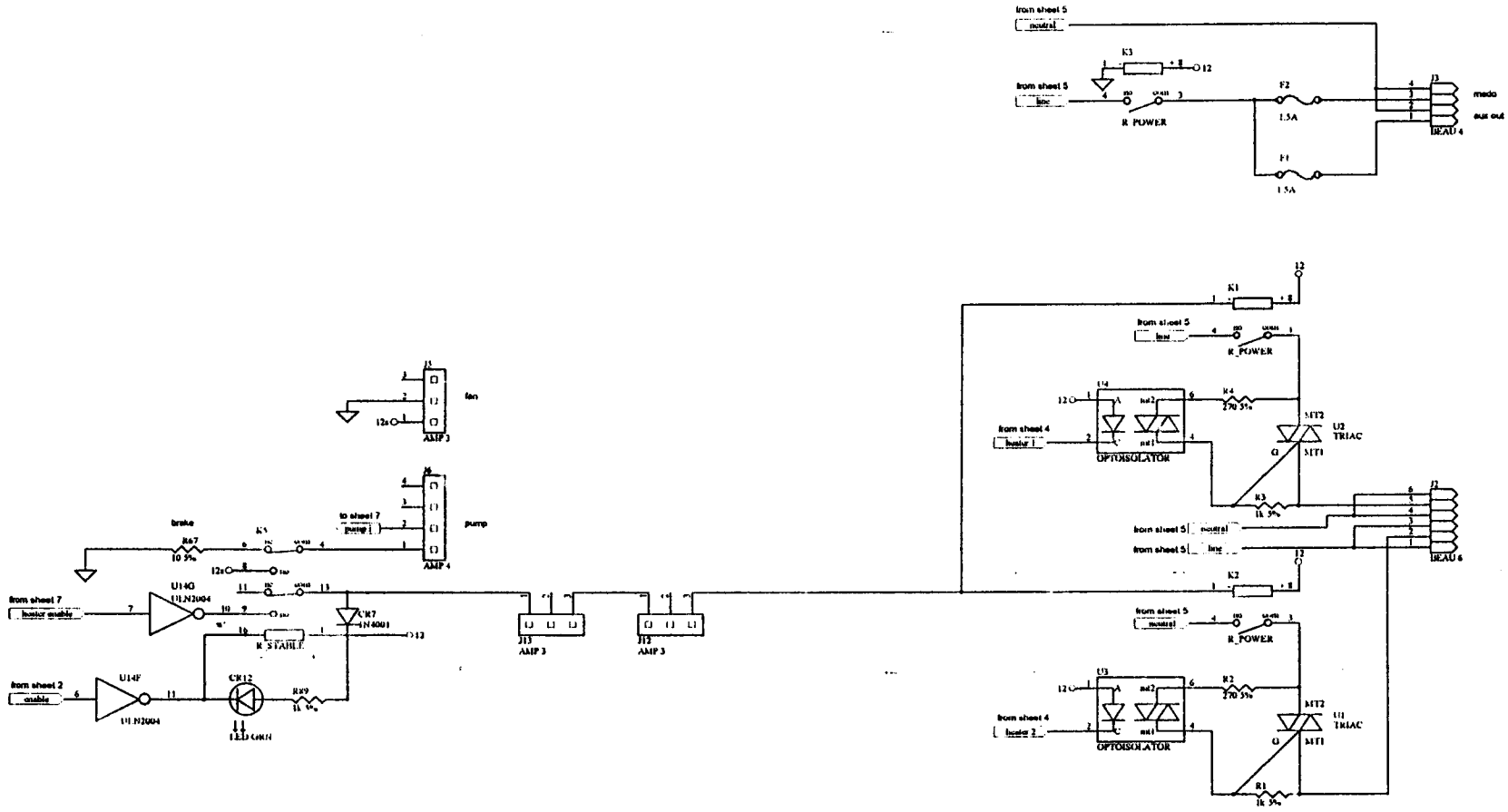

Resistors are 1% unless indicated

Title *Power Output for sys1000*

File: I:\ENGDATA\HARDWARE\PROTEL\REVC\PWROUT.SCH

Revision: C Date: 11-Apr-1996 Sheet 6 of 7

Error : LOGO.CLR WMF File Not Found

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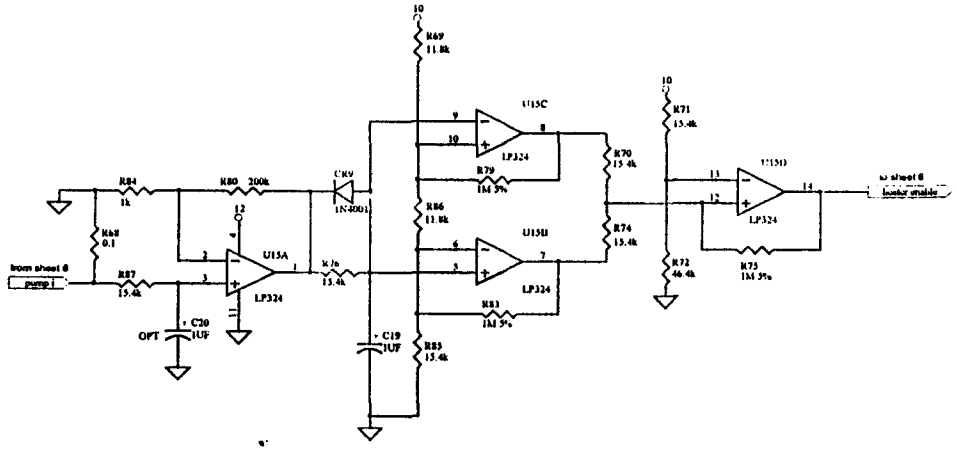

Resistors are 1% unless indicated

Error : LOGOCLR.WMF File Not Found

Title *Pump Condition Monitoring for sys1000*

File: I:\ENGDATA\HARDWARE\PROTEL\REVC\MONITOR.SCH

Revision: C Date: 11-Apr-1996 Sheet 7 of 7

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